



APPLICATION NO. 09/826,118

TITLE OF INVENTION: Wavelet Multi-Resolution Waveforms

INVENTOR: Urbain A. von der Embse

Currently amended ABSTRACT OF THE DISCLOSURE



APPLICATION NO. 09/826,118

TITLE OF THE INVENTION: ~~New~~ Wavelet Multi-Resolution Waveforms

INVENTORS: Urbain Alfred A. von der Embse

ABSTRACT OF THE DISCLOSURE

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~~The present invention describes a new method for the design of multi-resolution waveforms to improve system performance, design flexibility, applicability, and reduce the costs of implementation, compared to the current art. The multi-resolution waveform designs are a generalization of Wavelets to the Fourier domain. This generalization uses design algorithms which include application metrics to improve system performance, allows a single design to be used for all scales, and allows each design to be characterized by a relatively few parameters. Preliminary simulations indicate that waveform and filter performance can be significantly improved compared to current techniques for communications applications to code division multiple access (CDMA) waveforms and filters, communications constant-amplitude bandwidth efficient waveforms, and radar system applications.~~

Wavelets for multi-resolution waveforms and filters are designed to meet specific application requirements, are defined by a relatively small number of frequency harmonics, are complex, include a frequency translation, and can be designed to be orthogonal with no excess bandwidth for communications applications. Frequency design harmonics and frequency translation capability enable the waveforms at multiple resolutions to be derived from a single design by scaling the dilation, translation, and frequency translation parameters. Design is illustrated by Matlab 5.0 code to generate a linear filter waveform using an iterative least-squares eigenvalue approach to minimize the non-linear least-squares cost function,

and to scale this waveform design for multi-resolution applications specified by the dilation, time translation, and frequency translation parameters. Additional results are given for a constant amplitude minimum-shift-keying bandwidth-efficient modulation waveform and for a synthetic aperture radar waveform. Multi-resolution waveforms can be derived for other applications.